

RECENT LITERATURE.

Keeler on the 'Evolution of the Colors of North American Land Birds.'¹—Mr. Keeler's book is audacious and in some respects unique. At many points the author stalks with a bold tread where more experienced investigators would hardly dare to step. In this work an attempt is made to give a detailed explanation of how and why the land birds of North America have acquired their tints and markings. The subject chosen is thus one that might well be selected for the crowning work of a long life of special research instead of the maiden effort of one who has still his spurs to win in the field of zoölogical investigation. Mr. Keeler gives evidence of possessing a highly speculative turn of mind and considerable originality of thought. He also shows that he has made himself fairly conversant with the literature relating to the general subject of evolution, and that this is his chief preparation for the work in hand, it being painfully evident that he is seriously handicapped in his undertaking by lack of experience and familiarity with exotic birds.

Before passing to a detailed notice of his work, we will transcribe the opening paragraph of his preface: "The present paper has been written more with the hope of stimulating thought and inciting research in a new and as yet almost untrodden field of ornithological inquiry, than with the expectation of reaching definite results. The subject is as yet too new and difficult to be reduced to even the semblance of an exact science, and accordingly all the views here set forth are more or less provisional and tentative. I have constantly proceeded upon the assumption that a poor theory is better than no theory, provided it be not considered as final, since it affords an opening wedge for the further study of a subject. Accordingly many of the views here set forth are hardly to be considered as more than guesses, and it is expected that future study will serve to show their fallacy. If they lead to further study, however, and to more exact and comprehensive work by others, I shall be glad to see them overturned and their places filled by more worthy hypotheses."

The attitude here assumed is commendably modest, but it is hardly borne out by the general tenor of what follows. We cannot agree with him, however, that "a poor theory is better than no theory," even if it is put forth tentatively; we believe it is much better, and far safer for the best interests of science, to confess ignorance on abstruse points than to set forth views that "are hardly to be considered as more than guesses,"—in other words, hap-hazard conjectures, which may or may not have an element of probability, according to the fitness of the guesser to

¹Evolution of the Colors of North American Land Birds. By Charles A. Keeler. San Francisco: California Academy of Sciences. January, 1893. 8vo, pp. xii + 361, pl. xix. = Occasional Papers of the California Academy of Sciences, III.

express an opinion on the question at issue, or his proneness to give rein to his fancy on slight provocation. It is obvious that a *wrong* theory is worse than no theory; for to the lay reader or half-informed student who is unable to discriminate properly between the probable and the improbable, it is sure to be positively misleading. Pure speculation is the bane of science; it misguides the uninitiated and disgusts the well-informed. Many writers more gifted with imagination than with knowledge have contributed largely to romance under the guise of science, and especially is this the case in the particular field which includes such topics as Mr. Keeler here treats.

We do not wish this to be construed, however, as a wholesale condemnation of Mr. Keeler, or of theorizing in general; on the contrary we find much to commend in Mr. Keeler, and recognize the absolute necessity of hypotheses in scientific research; we wish merely to emphasize the fact that there is much natural history romancing which has wide currency as 'science.' A fair acquaintance with current theories respecting a few special phases of the subject of evolution, a merely superficial knowledge of the underlying principles, and a vast ignorance of the facts, of biology at large, is too apt to form the equipment and the incentive of some of our boldest theorists in the field of speculative biology, for whom nature has no secrets beyond their power to explain. This, indeed, is our estimate of much of the speculative writings of Poulton, Romanes, Weismann, and many other writers who have of late been so prolific of explanations of the abstruse things in nature, whom Mr. Keeler so freely quotes, and whom he has evidently taken as his models. He has, however, shown in general less discretion and more recklessness in his conclusions and generalizations.

Mr. Keeler's work consists of two parts, an 'Introduction,' occupying the first 132 pages, the remainder being devoted to 'The Colors of North American Birds' (pp. 132-336). Then follows a bibliography, explanations of plates, and an excellent index. The first part treats of general questions, such as 'The Inheritance of Acquired Characters' (pp. 2-50), 'Variation and Natural Selection' (pp. 50-63), 'Laws conditioning Evolution' (pp. 64-80), 'Sexual Selection' (pp. 80-102), 'The Nature of Species' (pp. 103-109), and 'Isolation as a Factor in the Evolution of Species' (pp. 110-132).

As Mr. Keeler says, in view of the disagreement between the leading writers of the different schools, "it is quite impossible to undertake any general scientific investigation in the field of evolution without a tolerable survey of the whole ground." As he further says: "There is hardly one of the important doctrines concerning which a consensus of scientific opinion has been attained. To be sure, all maintain that Darwinism or natural selection is a factor in evolution, but while some hold it to be the only factor, and all-sufficient in the creation of species, others believe it to be a very minor agency, and relegate it to the post of inspector-general of the army of life. With regard to sexual selection the

same diversity of opinion prevails, one school advocating sexual selection as the sole agent in producing the brilliant colors and varied plumes of male birds, etc., the other extreme asserting that sexual selection as a factor in evolution is a myth. Still greater is the diversity of opinion and more intense the feeling in regard to that momentous question which is at present agitating the troubled sea of scientific thought—the transmission of acquired characters.”

Concerning all of these leading questions Mr. Keeler spreads before his readers the pros and cons of the argument as presented by leading champions, giving a concise history and impartial summary of the contesting theories. Mr. Keeler also now and then attempts to weigh the evidence brought forward by the different opposing advocates, but for the most part maintains a position of neutrality or judicial reserve to such an extent that it is sometimes difficult to see which side of the case he favors, till we reach his final summing up of the subject.

In discussing the inheritance of acquired characters he appears to allow great weight to the supposed distinction between the inheritance of a habit or the modification of a structure and the inheritance merely of a “constitutional tendency” to a given habit or to a given variation—a distinction we confess too occult for our comprehension. At the close of his discussion of heredity he says: “From all this we may come to a provisional conclusion that acquired characters are transmissible. We are justified in using this assumption as a working hypothesis, and in feeling confident that future investigation will place it upon a footing where it is beyond the possibility of refutation.” For this concession we are duly grateful!

Mr. Keeler admits himself to be a strong convert to the theory of sexual selection as he interprets it, and that it affords “a tolerably complete explanation of secondary sexual characters in birds,” after considering the evidence, pro and con, at considerable length. We are quite unable, however, to see the evidence as it appears to him; or at least to accept the principle of sexual selection as he applies it in the second part of his work; in other words, that the secondary sexual characters among birds, or among any other animals, are due to any great extent to voluntary selection on the part of the female. The subject is of course too broad to admit of discussion in the present connection.

Mr. Keeler, we are glad to see, gives the cold shoulder to Mr. Romanes’s rather baseless theory of ‘Physiological Selection,’ which has already received many well-merited thrusts, since it is primarily based upon an assumption not only impossible to prove in the slightest degree, but at the same time seemingly of the utmost improbability.

In the two hundred and odd pages devoted to ‘The Colors of North American Birds’ there is much that is suggestive and worthy of commendation, mixed with a great deal that is weak and unphilosophical, which on the whole leaves a feeling of regret and disappointment, when compared with the able presentation of the subjects treated in the first third of

the work under review. In his account of 'Modes of Plumage Changes' is an erroneous interpretation of the change of color in the young Arizona Hooded Oriole, the conclusion being reached that the "transition in this species is by an addition of pigment without moult." With part of the same material in hand that formed the basis of Mr. Keeler's conclusion, and much more of similar character representing a large number of other species, it is evident that he has misunderstood the facts in the case,—namely, that a common mottled transition stage of plumage has been mistaken for an actual change of color without moult. It is evident that this mottled phase of plumage, occurring in a very large number of species, is a permanent one for the time being, varying greatly in different individuals of the same age, and not a gradual color change without moult. This, of course, is not proof that there is never any change of color without moult, the only satisfactory proof of which, however, must obviously be based on observation of the living bird for a sufficient period to determine the nature of the change of color. Under 'General Principles of Color in Birds,' we are at a loss to see why the pigment should be considered any more a "product of waste" than the feathers themselves, or other portions of the integument. Mr. Keeler calls attention to "a curious parallelism between the colors" in species of *Pipilo* and *Setophaga* (p. 147), "which may be only a coincidence or may be a matter of profound significance." This being the case, how about similar parallelisms between these genera on the one hand and others in Australia, India, Africa, and South America? Or the cases of almost exact parallelism in pattern of coloration, and often even in color, of wholly unrelated genera in widely separated parts of the world, which occur over and over again in a considerable number of very distinct styles of coloration? The *Pipilo* style, the *Junco* style, the *Sturnella* style, the *Icterus* style, the *Mimus* style, and so on, occur over and over again among Old World birds; certain African Weaverbirds repeat the red shoulder spots of *Agelaius*, etc., while in other cases this same marking is repeated in blue, white, or yellow.

There is space to notice very few of the striking generalizations that occur so frequently in the second third of the book, but a few may be cited in illustration of the general criticism we are forced to make upon Part II as a whole. From reading pages 159-161 one would infer that the feather first grew to its proper size and form and was then decorated by the subsequent deposit of pigment, for we read: "Pigment is a definite chemical substance which travels through the various branches of the feather, advancing farthest and most rapidly along the lines of least resistance and accumulating in masses where the resistance is greatest. Now the pigment cells must reach the various parts of the feather by way of the shaft, and we should *a priori* expect to find that the resistance would be least right down the shaft. It might spread out a very short distance on the barbs, but the main tendency would be toward the tip." Again he says (p. 177): "It is evident that along the line of demarcation

of two colors the pigments are apt to get confused as to which is their proper route, and hence both come upon the same feather [in 'hybrid' feathers] by accident, as it were." Is it possible that Mr. Keeler is unaware that the tip of the feather forms first, and receives its pigment and markings, whatever they may be, before the middle and lower parts of the feather have passed beyond the gelatinous stage of the as yet not fully developed feather? This being the case it is needless to discuss "lines of least resistance" and "the development of pigment in mass when an obstacle is encountered," as illustrated by our author in the unhappy simile of a "panic-stricken mob"! Neither is it necessary to consider the various classifications and generalizations based on this erroneous departure,¹ that fill so many of the subsequent pages. Alas, the fewer facts for a nicely spun theory the better!

At page 181 he gives a list of markings not known to him to occur among birds; but if he had broadened his survey to other regions of the world he would have had no trouble in finding nearly all of them. Even our own Woodcock would have given him an example of "the top of the head barred," while numerous species of Old World Cuckoos and Kingfishers would have furnished still finer illustrations. And so on with most of the other unknown markings.

As one example, out of many, of slipshod generalization take the following from p. 196: "I would suggest that there is great probability that the habits of birds have been more or less determined by their colors"; as for example, in a group of olive green or gray birds "those which formed the habit of living in trees would survive, while those frequenting the ground, being more conspicuous, would perish," as would in like manner "brown birds which got up among trees" instead of remaining on the ground! The very next bird mentioned (p. 197) is the Brown Creeper, which has developed a "special protective resemblance" to the bark of trees.

¹ Even the most rudimentary knowledge of the method of feather growth, such for instance as could be gained from Burmeister's note on the subject in Nitzsch's 'Pterylographie,' would have saved our author this humiliating mistake. Also if his general knowledge of feather structure had been a little more extended he would have saved himself the trouble of describing as 'A Supposed New Feather Structure' (Zoe, III, Oct. 1892, p. 257), the simple thread-like form of feather known since the time of Nitzsch as the *filopluma*, and mentioned in so readily accessible a work as Coues's 'Key to North American Birds' (p. 186). These filoplumes are present probably in all birds, and over large portions of the feathered tracts, instead of possibly proving, as Mr. Keeler suggests, "to be a generic character" in our Orioles. An inspection of plucked fowls in markets will furnish an instructive illustration of the general character of filoplumes, for which Mr. Keeler has so recently proposed the name *Pseudopilum*. In this connection we will venture to suggest that had our author devoted some time to a general study of pteryxæ in connection with special color areas he would have been rewarded by the discovery of many suggestive coincidences, and also that use of the microscope would have thrown much light upon the general subject of feather structure in its relation to coloration.

There is a large amount of nonsense, sparingly mixed with a few good suggestions, on the subject of 'Recognition Marks' and allied topics, for which our author is responsible only so far as to follow the hasty suggestions of various predecessors and of adding more of like character. "With the Crows and Blackbirds," he says (p. 203), "which habitually consort in flocks, it is quite possible that means of recognition has been at least one factor in the production of black color." But it happens that Crows and Blackbirds (*i.e.*, Icteridæ) are not the only black birds in the world, which occur in a great number of families in various countries; nor are they all gregarious, nor are more than a small part of the gregarious birds black. It is apparently more than hinted (p. 152) that the concealed white color on the neck feathers of *Corvus cryptoleucus* may be due to a tendency to albinism, which "is common among Crows"! Does this statement coincide with the facts in the case, in comparing Crows with Thrushes, or with Sparrows, for example, or with birds in general?

"In the Passenger Pigeon (*Ectopistes migratorius*) the tail markings are highly complex. . . . The necessity for directive recognition marks would be especially necessary in a species moving in such large flocks, from which individuals or small parties would constantly get astray. It may be that the complex pattern on the tail feathers was evolved first as a discriminative mark, for except in size, the species might easily have been confused with the Mourning Dove (*Zenaidura macroura*) which has the tail marked with a simple irregular subterminal band of dusky" (p. 205). Did our author stop to reflect to what extent these "highly complex" tail marks are visible, or to what extent they would aid as recognition marks in comparison with the Pigeons highly distinctive call-note, or in what way they could possibly serve as "directive recognition marks" to stragglers that had wandered from the flock? These "highly complex" tail markings are found only at the extreme base of the tail, within the area normally concealed by the coverts, *and are therefore not visible under any ordinary conditions*. Hence we wonder whether Mr. Keeler took the trouble to examine even a museum specimen of the bird, or whether he depended upon the description which he copies from Mr. Ridgway's 'Manual,' which does not happen to state the particular portion of the tail thus marked. These are but a sample of the author's methods of reasoning and far-fetched theories. There is also evidence of much haste or carelessness in the preparation of many parts of the work, including slips in nomenclature, and contradictory statements or conflicting generalizations, sometimes following each other on almost consecutive pages.

While there is much that is valuable in the book, and many points that are well taken, Part II especially is largely vitiated by unsound reasoning, by misapprehension of facts, or by lack of general information on special points. It is very easy to speculate and surmise, even to the extent of giving the reader either one of several hypotheses, all perhaps equally worthless, for the explanation of a given fact, — easier perhaps than to

confess ignorance, which is after all what the whole proceeding plainly shows.

Plate IV furnishes a very striking and interesting illustration of head-markings, with arrows arranged to show how one form of marking may have been derived from another, and how all may be reduced to five general types. As, however, the birds representing the successive stages of modification belong usually to distantly related genera, or even families, and as the relationships, as our author says in the text (p. 187) "are not supposed to be genetic," it may be asked, Of what practical utility is this elaborate generalization? Or what light does it throw upon the real method of evolution of these various patterns?

Great stress is laid upon the "primitive streaked plumage," and upon the streaked feather as a primitive type. While this may be true in a restricted sense, and form a test of grade in a group of closely allied species, it fails when taken in a general sense, as for instance in comparing Pigeons and Tinamous (genus *Tinamus*) as groups with Thrushes and Sparrows, or many 'low' groups with higher ones.

While Mr. Keeler's book is highly original in both conception and execution, and exceedingly novel and interesting in its pictorial illustrations, it displays, we are pained to say, much misdirected energy; and unless the lay reader and the novice keep in mind the opening paragraph of the preface, they are liable to acquire a large amount of misinformation.—J. A. A.

Beddard's 'Animal Coloration.'¹—The present volume, says the author, is addressed to persons having no special knowledge of zoölogy, and its aim is "to furnish a general notion of the facts and theories relating to Animal Coloration." "It contains hardly anything novel, but professes to give some account of the principal phenomena of coloration exhibited by animals." It is thus mainly a review of previous theories and the facts on which they are based, with a running critical commentary representing the views of the author respecting the many disputed points at issue. It consists of six chapters, having the following headings: I. 'Introductory.—The Principal Facts of Animal Coloration' (pp. 1-41); II. 'Coloration affected by the Environment' (pp. 42-82); III. 'Protective Coloration' (pp. 83-147); IV. 'Warning Coloration' (pp. 148-192); V. 'Protective Mimicry' (pp. 193-252); VI. 'Sexual Coloration' (pp. 253-282).

Mr. Beddard distinguishes 'Colour' from 'Coloration,' the former relating to the actual tints, the latter to the arrangement or pattern of these tints. Colors are due either solely to the presence of definite pigments,

¹ Animal Coloration | an Account of | The Principal Facts and Theories | relating to the | Colors and Markings of Animals. | By | Frank E. Beddard, M. A. Oxon., F. R. S. E., etc., | Prosector to the Zoological Society of London, Lecturer on Biology at Guy's Hospital | With Four Colored Plates; and Woodcuts in the Text | [Monogram] London: Swan, Sonnenschein & Co. | New York: Macmillan & Co. | 1892. —8vo, pp. viii, 288.